WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005KS45B

Title: Fate of Nitrate Beneath Fields Irrigated with Treated Wastewater in Ford County, Kansas Using Field Data and Preferential Flow Modeling

Project Type: Research

Focus Categories: Models

Keywords: preferential flow modeling, nitrogen cycling, leaching, dye tracing, wastewater irrigation

Start Date: 03/01/2005

End Date: 02/28/2006

Federal Funds: $28,812

Non-Federal Matching Funds: $60,483

Congressional District: 2nd

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Abstract

With increasingly limited groundwater resources, reuse of treated wastewater provides an alternative source of water for irrigation of crops and landscaping. A long-term irrigation project with treated wastewater in Ford County, Kansas, will be the focus of this study. The use of treated wastewater at this site has resulted in high nitrate concentrations (10 – 50 mg/kg) throughout the upper 50-ft profile but at varying concentrations, suggesting that preferential flow processes have occurred at the proposed study area. Evaluation of the environmental impact of such land use strategies needs to be made in order to

determine if and when this process may impact usable groundwater at depth. We therefore are proposing to estimate the leaching rates and time of arrival of N- (and Cl-) contaminants using preferential flow and N-cycling numerical modeling in combination with field and laboratory measurements at the study site. This approach also will help to identify key parameters and processes that influence N losses in agricultural soils and can facilitate evaluation of the environmental impact of different land use practices.

To achieve this goal we are proposing to collect deep cores for physical and chemical properties characterization, including using the Geoprobe capabilities for electrical conductivity profiling; perform dye tracer experiments; install neutron moisture probe access tubes and regularly collect soil moisture data; and obtain soil chemical data, crop and irrigation application rate information, climatic data, and other additional information from the ongoing study in the area, which is managed by the two consultant co-PIs in this proposal. All these data will be used in a comprehensive N cycling model such as DAISY or RZWQM (both of which also account for preferential flow and transport) to identify key parameters and processes that influence N losses in the study area.

Results from this study will assist in determining leaching rates and fate of nitrogen in the High Plains aquifer from wastewater irrigation, provide additional data for enhancing the detailed nitrogen budget the consultant co-PI's have developed for the area in question, and assist in providing information for other areas where there is an interest in using reclaimed water for landscape irrigation as a means to conserve water or for disposal purposes.